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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/768,471	01/25/2001	Shinichi Minami	843.39542X00	3956

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EXAMINER

BAUMEISTER, BRADLEY W

ART UNIT PAPER NUMBER

2815

DATE MAILED: 06/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/768,471

Applicant(s)
Minami et al.

Examiner
B. William Baumeister

Art Unit
2815



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Apr 26, 2002
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 15-36 is/are pending in the application.
- 4a) Of the above, claim(s) 4-11, 15-21, and 23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 22, and 24-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2 6) ☐ Other:

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DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Election/Restriction

2. Applicant's election without traverse of invention IA in Paper No. 10 is acknowledged.

Claim Rejections - 35 U.S.C. § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3, 22, 24, 26, 27, and 29-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Vinn et al. '114. (Applicant uses different terminology to reference a given region in various claim sets. The following rejection will use the terminology employed in claim 1.)

- a. See FIGs 1 and 2 wherein Vinn depicts a Zener diode 10 comprising an n-type epitaxial substrate 14 doped 10^{15} ; a first, p-type region 40, 16, 18; a second, n-type region 20 doped 10^{20} formed under a central sub-portion of the first, p-type region; a plurality of contact

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holes 42,44 pass through oxide insulation 47 for electrically connecting conductors in a portion of the first semiconductor region that is outside of the first/second region junction. The portions 16, 18 of the first, p-type semiconductor region extend to a depth deeper than the portion of the p-type region that forms a junction with the n-type region 20.

b. Regarding claims 31 and 34, under the broadest reasonable interpretation, “surrounding” can be interpreted to mean two regions formed on either side of a third region. As such, P regions 16 and 18 and overlying holes associated with contacts 42 and 44 “surround” the pn junction region.

Claim Rejections - 35 U.S.C. § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-3, 22, 24-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howard, Jr. ‘179 in view of Matthews ‘554.

a. Howard teaches a zener diode having a p substrate 14; a p well 21; a p+region 22 having the upper portion disposed within p-well 21; and an n-region 32 forming a pn junction with p+ region 22. N region 32 has a wider cross-section than does p+ region 22. Further, n-region

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has a peripheral portion with a larger cross-section (greater diffusion depth) than the central pn-junction portion for the purpose of preventing spike-through (col. 5, lines 25-45) when a cathode contact C is formed through the overlying insulation. Thus, Howard teaches every limitation of the claims except for the recitation that the peripheral region has a plurality of through holes. Rather, Howard only discloses a single through hole extending along one side of the n-type region 32 periphery.

b. Matthews, directed towards a zener protection circuit, teaches that a plurality of uniformly spaced vias may be employed for each of the p and n regions for the purpose of providing uniform current distribution, thereby preventing high current densities and premature failure (col. 3, lines 35-45). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to have provided the Howard zener diode with a plurality of through holes in the insulation layer distributed to surround the periphery of the n-region 32 for the purpose of providing better current distribution, and thereby preventing high current densities and premature failure as taught by Matthews.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. JP 63-66974 teaches a zener diode having leads with a plurality of through-holes.

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- b. Ohuchi et al. '579 teaches an n/n-n/p+ reverse-bias avalanche diode with contacts to guard-ring regions that prevent surface breakdown.
- c. GB '792 teaches a zener diode with peripheral n+ regions of greater diffusion depth than that of the central region.
- d. Doluca '165 teaches a buried zener diode.
- e. Villa et al. '387 teaches a zener diode.
- f. Beasom '503 teaches a zener diode. See particularly FIG 8.
- g. Muggli '114 teaches a subsurface breakdown zener diode.

INFORMATION ON HOW TO CONTACT THE USPTO

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, **B. William Baumeister**, at (703) 306-9165. The examiner can normally be reached Monday through Friday, 8:30 a.m. to 5:00 p.m. If the Examiner is not available, the Examiner's supervisor, Mr. Eddie Lee, can be reached at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



B. William Baumeister

Patent Examiner, Art Unit 2815

June 20, 2002